METHOD FOR SHAPING A SEAMLESS ALUMIUM WHEEL RIM

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to a method for manufacturing a vehicle wheel rim, which is simpler and lower cost than a conventional manufacturing method.

2. The Related Art

[0002] In the considerations of reducing the weight of a vehicle body and promoting its control and appearance, a vehicle wheel rim is mostly manufactured by aluminum alloy material now. Although a conventional method can manufacture a superior performance and appearance of aluminum wheel rim, it still exists some defects. For example the strength thereof cannot be further increased, the manufacturing processes thereof are too complicate, and the manufacturing cost thereof cannot be reduced. Three conventional methods for manufacturing an aluminum wheel rim and the defects thereof in reference to the accompanying drawings are described as the followings.

[0003] Figure 1 shows a first conventional gravity casting method for manufacturing an aluminum wheel rim. A wheel-rim-shaped mold cavity **A1** is pre-designed in a foundry mold **A**. Then a melting aluminum alloy is poured into the mold cavity **A1**. After cooled, the casting is taken out from the mold **A** and is processed through a heat treatment and machining procedures to form a wheel rim. However using a foundry mold to manufacture a wheel rim, it easily produces sand holes due to the melting aluminum alloy containing airs. When it is mounted to a wheel tire, a leak will occur. In addition, due to micron sand holes, it is hard to manufacture a wheel rim with chromate treatment to meet market requirements. That further results in a drawback of high manufacturing cost of wheel rim with chromate treatment.

[0004] Figure 2 shows a second conventional welding and spinning method for manufacturing an aluminum wheel rim. Firstly, a rectangular aluminum alloy plate **B** is rolled up by a rolling machine to form a cylindrical shell **B1**, then joint the

two ends thereof together by a welding process, and finally shape it into a wheel rim **B2** by a spinning machine. However this method needs rolling up, welding and spinning procedures so that the manufacturing time and cost thereof are relatively higher. Furthermore, the strength thereof is weaker than that of a wheel rim manufactured by the present invention.

[0005] Figure 3 shows a third conventional spinning method for manufacturing an aluminum wheel rim, which first manufactures two wheel rim parts and then mounts them together using fixing devices. Firstly, two different sizes of aluminum alloy plates **C** are respectively spun into a first wheel rim part **C1** and a second wheel rim part **C2**. The first wheel rim part **C1** and the second wheel rim part **C2** are then jointed together through a wheel disc, bolts and nuts. However the third method needs two times of spinning, drilling and jointing procedures. Therefore the manufacturing time thereof cannot be further reduced. The condition of a leak even a loose of the wheel rim may occur due to vibration in the movement of vehicles. And the strength thereof is weaker than that of a wheel rim manufactured by the present invention.

[0006] In view of the defects of the above conventional methods for manufacturing an aluminum wheel rim, the present invention provides with a more superior method to manufacture a higher strength, better performance and lower cost of wheel rim.

SUMMARY OF THE INVENTION

[0007] The present invention is to solve the defects that a wheel rim manufactured by conventional methods has a higher manufacturing cost, the strength thereof cannot be further increased and the weight thereof is heavier.

[0008] A method for manufacturing a seamless wheel rim in accordance with the present invention is to first deeply draw a pre-cut circular aluminum alloy plate into a cup-shaped embryo body, punch out the bottom surface thereof to form a hollow cylinder, then put it into an expanding-pressing female die with an expanding die cavity at both ends thereof respectively, and finally press and expand the both ends of the embryo body by two sets of expanding-pressing male dies to form a seamless aluminum wheel rim in sequence.

[0009] An object of a method for shaping a seamless aluminum wheel rim in accordance with the present invention is to provide with a one-mold construction wheel rim without seams on the surface thereof so that the strength thereof can be increased and there is no leak problem.

[0010] A second object of the method for shaping a seamless aluminum wheel rim in accordance with the present invention is to use a fewer machine equipments and less manufacturing time to manufacture a more superior wheel rim and reduce the manufacturing cost thereof.

[0011] Another object of the method for shaping a seamless aluminum wheel rim in accordance with the present invention is to promote the strength of an aluminum wheel rim to meet the requirement of a large size of vehicle wheel with lightweight. For example, a 24" casting wheel rim weighs 24 kilograms but a same size wheel rim manufactured by the present invention weighs only 18 kilograms.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012] Figure 1 is a schematic diagram showing a manufacturing process of a conventional gravity casting method for manufacturing a wheel rim and the structure thereof.

[0013] Figure 2 is a schematic diagram showing a manufacturing process of a conventional welding and spinning method for manufacturing a wheel rim and the structure thereof.

[0013] Figure 3 is a schematic diagram showing a manufacturing process of a conventional spinning method for manufacturing a wheel rim, which first manufactures two wheel rim parts and then joint them together by a wheel disc in combination with bolts and nuts.

[0014] Figure 4 is a schematic diagram showing a manufacturing process of a method for manufacturing a wheel rim and the structure thereof in accordance with the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0015] Referring to Figure 4, a method for shaping a seamless aluminum wheel rim in accordance with the present invention comprises the following steps of:

[0016] (1) cutting an aluminum alloy plate into a circular plate **1**;

[0017] (2) the circular aluminum alloy plate **1** being drew into a cup-shaped embryo body **1A** by a deep drawing die **2**, wherein an end of the embryo body **1A** is shaped into a cup-shaped cylinder **1A2** and the other end thereof is an embryo expansion part **1A1**;

[0018] (3) the bottom surface of the cup-shaped cylinder **1A2** being punched out to form a hollow cylinder; and

[0019] (4) the cup-shaped embryo body **1A** being put into an expanding-pressing female die **3** with an expanding die cavity respectively at both ends thereof, and then pressed and expanded by two sets of expanding-pressing male dies respectively at both ends of the embryo body **1A** to make the embryo expansion part **1A1** and the cylinder **1A2** respectively form a first expansion part **1B1** and a second expansion part **1B2** that construct a wheel rim **1B**.

[0020] The detailed shaping steps are further described as the followings. As shown in Figures 1(a)-(d), an aluminum-plate (material No. 6061) with a thickness 6-7 mm is selected as a work. It is pre-cut into a circular plate **1**. The circular plate **1** is shaped into a cup-shaped embryo body **1A** by a deep drawing die **2**, wherein an end of the embryo body **1A** is shaped into a cup-shaped cylinder **1A2** and the other end thereof is an embryo expansion part **1A1**. The diameter of the embryo expansion part **1A1** is greater than that of the cylinder **1A2**. The bottom surface of the embryo body **1A** is then punched out by a punch press to form a hollow cylinder. The embryo expansion part **1A1** is not a final expansion part of a wheel rim but a pre-shape similar to a continuous die.

[0021] The expanding-pressing female die **3** is a die being able to be opened in lateral direction. Both ends of the die cavity of the expanding-pressing female die **3** are penetrated through each other and respectively forms a first expanding die cavity **31** and a second expanding die cavity **32** (refer to Figure 1(d)). The shaping process comprises that the cylinder **1A2** of the embryo body **1A** is inserted from the first expanding die cavity **31** into the second expanding die cavity **32** (referring to Figure 1(e)); a first expanding-pressing male die **4** is extruded by an oil pressure machine into the expanding-pressing female die **3** downwards to make the embryo expansion part **1A1** further be shaped into a final first expansion part **1B1** (referring to

Figure 1(f)); next, the embryo body **1A** is turned over 180 degrees to make the hollow cylinder **1A2** upwards; a second expanding-pressing male die **4A** is extruded by an oil pressure machine into the expanding-pressing female die **3** downwards to make the hollow cylinder **1A2** be shaped into a second expansion part **1B2** (referring to Figure 1(g)); and after opening the expanding-pressing female die **3**, a shaped wheel rim **1B** (refer to Figure 1(h)) is taken out. In view that the wheel rim **1B** can operate after it is mounted to a wheel seat of vehicle, therefore it should be mounted with a wheel disc that is mounted to the wheel seat of vehicle. The wheel disc is not an appealed key point of the present invention. Therefore it is not described here.

[0022] The manufacturing method of the present invention only uses a set of drawing die and two sets of expanding-pressing dies to shape a seamless aluminum alloy wheel rim. The equipment and manufacturing costs thereof are very low. The wheel rim has a superior performance and very high strength due to seamless.

[0019] The above statement is only for illustrating the preferred embodiment of the present invention, and not for giving any limitation to the scope of the present invention. It will be apparent to those skilled in this art that all equivalent modifications and changes shall fall within the scope of the appended claims and are intended to form part of this invention.